Alcohol Consumption, Drug Use, and Condom Use Among STD Clinic Patients*

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ABSTRACT. Objective: Research on the association between substance use and sexual risk behavior has yielded a complex pattern of findings. Such inconsistent findings may reflect method variance, including factors such as gender of the participant, nature of the sexual event, partner characteristics, and type of substance used. The purpose of this study was to investigate the association between substance use and unprotected sex independently for alcohol, drugs, or combined substance use and to examine partner characteristics as a moderator of this association. **Method:** Participants (N = 1,419; 48% women) were recruited from a publicly funded sexually transmitted disease clinic and were asked to complete an audio computer-assisted self-interview regarding their most recent sexual experience, including nature of the event, substance use, and partner characteristics. **Results:** Analyses showed that alcohol use was related to condom use when gender and partner type were considered; thus, for women, but not for men, partner type interacted with alcohol consumption such that condom use was less likely when alcohol consumption preceded sex with nonprimary partners (drinking was unrelated to condom use with primary partners). Subsequent analyses examining partner substance use showed that women, but not men, who reported both they and their nonprimary partners were drinking during sex were less likely to use a condom. **Conclusions:** At the event level, alcohol consumption among sexually transmitted disease clinic patients is associated with condom use, but this association differs by gender and partner characteristics. Findings suggest the need to strengthen substance-use components in sexual risk reduction interventions for women and their partners. (*J. Stud. Alcohol Drugs* **70:** 762-770, 2009)

DESPITE PUBLIC HEALTH EFFORTS to provide individuals with information about sexual risk reduction, sexually transmitted diseases (STDs) remain a public health concern. Surveillance efforts suggest an estimated 19 million new infections in the United States per year (Centers for Disease Control and Prevention, 2008). In 2006, more than 45,000 (of 56,300) new cases of HIV/AIDS have been attributed to sexual transmission; in addition, more than 1 million cases of chlamydia and 355,991 cases of gonorrhea were reported in 2007 (Centers for Disease Control and Prevention, 2008, 2009). Worldwide, an estimated 340 million new cases of curable STDs and 2.7 million new cases of HIV (primarily attributable to sexual transmission) occurred annually (Joint United Nations Programme on HIV/AIDS, 2008; World Health Organization, 2001). Untreated STDs can result in pelvic inflammatory disease, chronic pelvic pain, and infertility among women and epididymitis and urethritis among men (Centers for Disease Control and Prevention, 2008) and also can facilitate the transmission of HIV (Eng and Butler, 1997; Fleming and Wasserheit, 1999).

To prevent sexual transmission of HIV, the Centers for Disease Control and Prevention recommends early STD diagnosis and treatment in conjunction with a targeted HIV prevention plan (Centers for Disease Control and Prevention, 1998, 2007). Research with STD clinic patients can facilitate HIV prevention. Indeed, identifying factors related to sexual risk among STD clinic patients is important because (1) STD patients, compared with the general population, are more likely to acquire multiple nonviral STDs (i.e., "STD repeaters"); (2) STD patients with repeat STDs may sustain an outbreak in a community (Leichliter et al., 2007); and (3) STD acquisition requires unprotected sexual behavior that puts people at risk for acquiring HIV.

Patients in STD clinics often report other health-related problems, such as high levels of alcohol and drug use that may exacerbate their risk for HIV and/or STDs (Appel et al., 2006; Cook et al., 2006; Mackenzie et al., 1998). Several studies have examined the association between substance use and risky sexual behavior among various populations (e.g., adolescents, men who have sex with men); however, evidence of an association has been mixed (Cooper, 2002; Leigh, 2002; Leigh and Stall, 1993; Weinhardt and Carey, 2000). Studies examining the association between risky sexual behavior and the overall frequency of substance use show higher rates of unprotected sex, sex with multiple partners, and STD diagnoses among STD clinic patients who report

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high levels of substance use (Cachay et al., 2004; Cook et al., 2006; Kim et al., 2003). In these studies, it is unclear whether participants engage in risky sexual behavior because they are drinking or as a result of some additional factor that facilitates both risk behaviors.

Examining sexual behavior during a specific sexual event (i.e., at the event level) provides a more precise gauge of the association between substance use and risky sex. The few studies examining event-level data from STD patients have found mixed results. For example, substance use concurrent with sex has been associated with sexual risk among male, but not female, patients (Fortenberry et al., 1997; Weinstock et al., 1993). Mixed results are consistent with the broader event-level literature (Leigh, 2002), prompting researchers to seek potential moderators (e.g., gender, partner type, partner substance-use status) of the risky sex–substance use association and other factors that may influence the association, such as differentiating between alcohol use and the use of specific types of drugs (Leigh et al., 2008a). Given the discrepant findings, further research examining both the direct and moderated effects of substance use on risky sexual behavior at the event level is warranted to better understand sexual risk taking in this subgroup.

Prior event-level research suggests several possible moderators of the association between risky sexual behavior and substance use. First, several studies suggest that partner type (i.e., primary vs nonprimary) influences the association (Brown and Vanable, 2007; Vanable et al., 2004). Event-level studies among gay and bisexual men (Gillmore et al., 2002; Vanable et al., 2004), college students (Brown and Vanable, 2007; Labrie et al., 2005), and drug users (Arasteh et al., 2008; Leigh et al., 2008a) and a national survey of U.S. adults (Schafer et al., 1994) have shown an increase in the probability of unprotected sex concurrent with substance use with nonprimary sexual partners. Some studies have shown a decrease in the probability of unprotected sex concurrent with substance use with nonprimary partners (Leigh et al., 2008b), whereas other studies have shown no impact of partner type on the association between substance use and risky sexual behavior (Gillmore et al., 2002). Moreover, the influence of partner type on the risky sex–substance use association tends to vary by gender, indicating an increased probability among men (Labrie et al., 2005; Leigh et al., 2008a; Vanable et al., 2004) but a decreased probability among women (Leigh et al., 2008b) with nonprimary sexual partners. Second, recent research among intravenous drug users suggested that risky sexual behavior increases when both partners are intoxicated with alcohol (Arasteh et al., 2008). Furthermore, this association between partner drinking and condom use interacted with partner type such that, when both the intravenous drug users and their nonprimary partner were drinking, they were less likely to use a condom. Third, studies examining the influence of substance use on risky sex often exclude drug use or combine alcohol and other drug use in analyses (Leigh, 2002). Because, as Leigh (2002) suggests, different types of substances have unique pharmacological effects, situation-specific uses, and different reasons for use, the risky sex–substance use association may differ by type of substance, consistent with recent research (Leigh et al., 2008a). Finally, results from meta-analytic and literature reviews have found an inconsistent association between substance use and risky sex with respect to gender (Cooper, 2002; Leigh, 2002; Weinhardt and Carey, 2000). Because women, compared with men, have less control over condom use (Campbell, 1995; Karlamangla et al., 2006; Pearson, 2006), more self-regulation and greater social skills are required for women to influence the use of condoms during sex. Drinking or drug use may impair women's capacity to negotiate condom use; hence, the association may be more pronounced for women rather than men.

The current study uses event-level methodology to examine the association between risky sexual behavior and substance use among STD clinic patients. Specifically, we examine situational (partner characteristics: primary vs nonprimary partners *and* none, one partner, or both partners using substances), contextual (type of substance use: alcohol use, drug use, or combined alcohol and drug use), and individual (gender: men, women) factors that may influence the association of substance use to risky sex. Examining the association between sexual behavior and substance use, including factors known to be related to risky sexual behavior, can guide intervention development to avert new infections among STD clinic patients.

Method

Participants and procedures

Patients attending a publicly funded, "walk-in" STD clinic in Rochester, NY, were recruited between March 2004 and June 2006 for a randomized clinical trial evaluating intervention programs to reduce sexual risk among STD patients (Carey et al., 2008b). To be eligible for the randomized clinical trial, patients needed to report being age 18 or older, engaging in risky sexual behavior during the past 90 days (e.g., vaginal or anal sex without a condom; having more than one sexual partner; having an STD; or having a sex partner who had other partners, injected drugs, or was diagnosed with HIV or other STDs), and having a willingness to be tested for HIV. Patients were excluded if they were infected with HIV (HIV-positive patients were referred for more comprehensive services appropriate to their needs), mentally impaired, receiving inpatient substance-abuse treatment, or planning on moving within the next year.

Eligible patients (n = 2,691) met with a research assistant in a private examination room and were given details about the study; those who remained interested (n = 1,559 patients) provided written consent. The vast majority (82%) of patients

who declined cited lack of time as the reason for declination. Consenting to the trial was associated with female gender, nonwhite race, having less education, being a returning patient, and having a greater number of sexual partners in the past 3 months (Carey et al., 2008a).

Consenting patients completed an audio computer-assisted self-interview on a laptop computer and were reimbursed $20 for their time. Of the 1,559 patients who consented, 14 withdrew, 8 tested positive for HIV and were referred for more comprehensive services, and 54 were part of a pilot sample, leaving 1,483 participants (46% female, 64% Black, mean age = 29 years) who contributed data for the current analyses. The study protocol was approved by institutional review boards of the participating institutions, and, to protect participant privacy, a Federal Certificate of Confidentiality was obtained.

Measures

Baseline surveys assessed demographic information (e.g., gender, ethnicity, age), most recent sexual behavior, and additional measures (e.g., sex-related behavioral skills) as part of the larger randomized clinical trial. Most recent sexual behavior was assessed through a series of items. Patients were asked whether their most recent sexual experience was with a primary partner (defined as a close partner, such as a husband/wife, boyfriend/girlfriend whom they really care about) or an outside partner (i.e., any other sexual partner in the past 3 months, besides the primary partner), when this sex event occurred, the type of sex (vaginal, anal, and/or oral), whether condoms were used, and whether they or their partner used alcohol and/or drugs before sex ("Did you use [Was your sexual partner using] alcohol [drugs] before you had sex?"). Participants were given definitions of sexual terms (e.g., vaginal sex). A series of items were used to assess global alcohol- and drug-use patterns. With respect to the previous 3 months, participants were asked how many days per week they drank alcohol, the number of alcoholic beverages consumed per drinking day, and the frequency of heavy drinking (using standard definitions of heavy drinking; cf. Wechsler et al., 2002). Drug use (1) versus no drug use (0) was indicated by responding "yes" to having used any of the following substances in the past 3 months: marijuana, crack cocaine, cocaine powder, nitrite inhalants, methamphetamines, heroin, or Ecstasy. Participants who indicated any drug use (e.g., indicated "yes" for marijuana) were categorized as using drugs. All questions have been used in previous research (Carey et al., 1997, 2000, 2004).

Data management and analysis

Data analyses were restricted to vaginal and/or anal sex events given the relatively lower risk of HIV transmission through oral sex (Campo et al., 2006). For all analyses, results are based on variables that combine vaginal and anal sex; participants reporting only oral sex are *not* included (n = 41). Thus, the term *sex* refers to vaginal *and/or* anal sex. Because condom use was assessed separately for both vaginal and anal sex, some participants reported using a condom for only one of the two types of sex during the most recent sexual occasion. For those patients (n = 9), condom use was coded as *none,* given that lack of condom use for either vaginal *or* anal sex confers risk of STD or HIV transmission.

Summary statistics (frequencies, means and standard deviations) were used to describe characteristics of the last sexual occasion for the overall sample and by gender. Differences between women and men were examined using chi-square analysis (for dichotomous and polytomous measures) or t tests (for continuous measures). To test our predictions, we used logistic regression analyses to examine the association between substance use (alcohol, drugs, and combined use) and condom use. Specifically, the probability of condom use (yes, no) was predicted from substance use (alcohol, drugs, or combined use) concurrent with sex (yes, no) and partner type (nonprimary, primary) for the 1,419 patients reporting a sex event. We modeled substance use with three separate models to examine the effects of each type of substance (alcohol or drug use alone), as well as the effects of combined substance use on condoms. Because partner type and alcohol use (but not drug use) differed by gender, all analyses were conducted separately for women and men, resulting in six separate models. For all analyses, data were examined for outliers using the studentized residual statistic, with a recommended cutoff of ±3.0 for large sample sizes (Cohen et al., 2003). All data analyses were conducted using SPSS Version 16 (SPSS Inc., Chicago, IL).

Results

Characteristics of the sample

Of the 1,483 patients attending an STD clinic, 64 were excluded because they reported having only oral sex (n = 41) or not having sex at the most recent sexual occasion (n = 21), or did not respond (n = 2). At the most recent sexual occasion, our final sample of 1,419 patients reported 1,383 vaginal, 140 anal, and 793 oral sex events. Many of the participants (n = 820) reported engaging in more than one type of sex (vaginal, anal, and oral) during the last event. Primary sexual partners accounted for 61% of sexual events, whereas 39% of the sexual events were with nonprimary partners. A total of 519 (37%) participants reported vaginal and/or anal sexual events concurrent with alcohol and/or drugs.

At the global level, participants (n = 1,419) reported drinking an average (SD) of 1.73 (1.88) days per week, consuming an average of 2.69 (2.81) drinks in a typical drinking day, and reported 3.57 (5.63) occasions of heavy drinking in the past 3 months. Fifty-two percent reported using illegal

TABLE 1. Characteristics of the most recent sexual occasion (N = 1,419)

Variable	Women (n = 675) n	Women % or mean (SD)	Men (n = 744) n	Men % or mean (SD)	p[a]
Partner type					<.001
Primary	454	67%	410	55%	
Nonprimary	221	33%	334	45%	
When last event occurred					.976
Past week	365	54%	406	55%	
Past month	194	29%	213	29%	
Past 3 months	116	17%	125	17%	
Type of sex[b]					
Vaginal	673	98%	710	95%	<.001
Anal	62	9%	78	11%	.413
Oral	353	52%	440	59%	.010
Used condom, vaginal sex	177	26%	200	27%	.435
Used condom, anal sex	10	16%	18	23%	.307
Alcohol concurrent with sex	155	23%	245	33%	<.001
Number of alcoholic beverages	155	3.83 (2.34)	245	5.07 (3.25)	<.001
Drug use concurrent with sex	121	18%	146	20%	.414
Partner used alcohol before sex	222	33%	220	30%	.816
Partner used drugs before sex	116	17%	112	15%	.200

[a]Chi-square or independent t test for gender differences; [b]some participants (n = 820) reported more than one type of sex at last occasion.

drugs in the past 3 months, mostly marijuana use (90%). Of the participants (n = 519) reporting concurrent sex and alcohol and/or drug use, 252 consumed alcohol, 119 used drugs, and 148 used both alcohol and drugs (900 did not report using alcohol or drugs). Table 1 reports a summary of the final sample of 1,419 participants' behavioral characteristics at the most recent sexual occasion by gender.

Condoms were used in 27% of the sexual events (22% of events with primary partners and 34% of events with nonprimary partners). The proportion of patients reporting condom use did not vary as a function of ethnicity, employment, or income (all ps < .05) but did vary according to age, education, and marital status. Patients who reported condom use were younger (mean age = 24.66 [7.67] years) than patients who did not use a condom (mean age = 29.84 [9.89] years, p < .001). Condom use was more likely to be reported by patients who had a least some college education (30%) than by patients who had a high school education or less (25%; p = .04). Finally, patients who were currently single (28%) were more likely to use a condom at the last sexual occasion than those who were married (16%; p = .01). We controlled for age, education level, and marital status in the analyses.

Event-level analyses

Logistic regression analyses were used to predict the probability of condom use (yes, no) from substance use concurrent with sex (yes, no). In preliminary analyses, we examined bivariate associations between condom use and substance use (alcohol, drugs, or combined use), followed by multivariate models that included partner type (nonprimary, primary) as an event-level variable. Our initial analyses indicated that neither alcohol use, nor drug use, nor combined substance use was associated with condom use for either women or

TABLE 2. Odds ratio (OR) and 95% confidence interval (CI) of condom use at last sex

Predictor	Crude OR (95% CI)	Adjusted[a] OR (95% CI)
Women		
Alcohol consumption concurrent with sex	1.07 (0.66-1.75)	0.98 (0.59-1.62)
Drug use concurrent with sex	0.78 (0.42-1.47)	0.84 (0.44-1.60)
Alcohol and drug use concurrent with sex	0.95 (0.50-1.81)	1.11 (0.58-2.16)
Men		
Alcohol consumption concurrent with sex	0.89 (0.59-1.34)	0.87 (0.57-1.33)
Drug use concurrent with sex	1.02 (0.55-1.89)	0.87 (0.46-1.64)
Alcohol and drug use concurrent with sex	0.72 (0.42-1.22)	0.70 (0.41-1.20)

Notes: Separate logistic regression analyses were used to examine alcohol consumption, drug use, and combined substance use as predictors of condom use at last sexual event for women and men. All substance-use variables were dummy coded (1 = yes, 0 = no).
[a]Adjusted for age, education, and marital status.

TABLE 3. Logistic regression analyses examining the effects of substance use and partner type on condom use at last sex by gender

	Women		Men	
Predictor	AOR (95% CI)	*p*	AOR (95% CI)	*p*
Alcohol use	(*n* = 554)		(*n* = 597)	
Age	0.62 (0.48-0.80)	<.001	0.63 (0.51-0.78)	<.001
Education	0.60 (0.40-0.90)	.013	0.85 (0.58-1.24)	.395
Marital status	1.98 (0.74-5.31)	.175	2.09 (0.78-5.59)	.143
Alcohol use concurrent with sex	1.68 (0.89-3.16)	.108	0.57 (0.26-1.24)	.154
Partner type	2.46 (1.55-3.90)	<.001	2.07 (1.35-3.18)	.001
Alcohol Use × Partner Type	0.21 (0.07-0.60)	.004	1.42 (0.55-3.66)	.465
Drug use	(*n* = 520)		(*n* = 498)	
Age	0.68 (0.54-0.87)	.002	0.62 (0.49-0.80)	<.001
Education	0.59 (0.38-0.89)	.013	0.96 (0.63-1.45)	.832
Marital status	1.17 (0.51-2.69)	.721	3.04 (0.88-10.45)	.078
Drug use (nonalcohol) concurrent with sex	0.94 (0.41-2.14)	.873	1.00 (0.42-2.40)	.998
Partner type	2.46 (1.55-3.88)	<.001	2.08 (1.36-3.19)	.001
Drug Use (nonalcohol) × Partner Type	0.65 (0.17-2.43)	.519	0.66 (0.19-2.35)	.525
Combined substance use	(*n* = 511)		(*n* = 536)	
Age	0.63 (0.49-0.81)	<.001	0.64 (0.51-0.81)	<.001
Education	0.55 (0.36-0.84)	.006	0.86 (0.58-1.28)	.463
Marital status	1.49 (0.59-3.77)	.405	2.10 (0.70-6.31)	.184
Substance use concurrent with sex	1.46 (0.50-4.25)	.488	0.58 (0.25-1.39)	.223
Partner type	2.47 (1.55-3.92)	<.001	2.06 (1.35-3.16)	.001
Substance Use × Partner Type	0.41 (0.10-1.62)	.204	1.13 (0.37-3.46)	.829

Notes: Age is a continuous variable and was centered; all other variables were dummy coded (education: 1 = high school degree or less, 0 = at least some college; marital status: 1 = currently single, 0 = married; alcohol, drug, or substance use concurrent with sex: 1 = yes, 0 = no; partner type: 1 = nonprimary, 0 = primary). AOR = adjusted odds ratio; CI = confidence interval.

men (see Table 2). Among women, condoms were used in 27%, 26%, and 26% events concurrent with alcohol, drugs, or combined substance use, respectively, and 26% of events when no alcohol, drugs, or combined substances were used. For men, condoms were used in 29% of all events concurrent with alcohol and/or drug use and 29% of events when no alcohol, drugs, or combined substances were used.

Table 3 summarizes analyses that included partner type in the model, controlling for age, marital status, and education level. (Because restricting analyses to heterosexual patients did not change the findings, we report results from all patients engaging in vaginal and/or anal sex.) In these analyses, we included partner type and each substance-use classification as main effects, as well as the partner type by

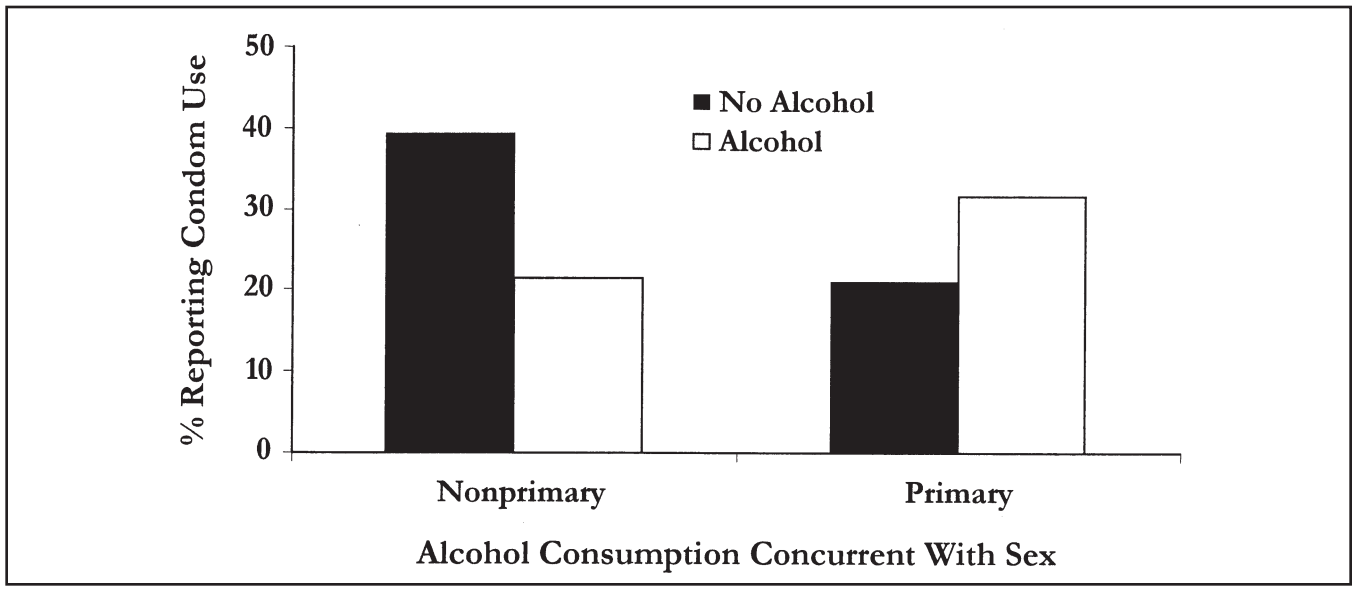

FIGURE 1. Proportion of women patients reporting condom use concurrent with alcohol consumption or when no alcohol was consumed by partner type

substance-use interaction terms to test for potential partner type differences in the association of substance use to sexual risk. For men, the odds of condom use were not related to alcohol consumption, drug use, or combined alcohol and drug use (regardless of partner type; *p*s > .05). In all three models, the odds of condom use increased when men had sex with nonprimary versus primary partners (adjusted odds ratios [ORs]: 2.06-2.08, *p*s = .001). No significant interactions between substance use (alcohol, drugs, or combined substances) were found among men.

Among women, the association between type of substance and condom use was more complex. Type of substance use (alcohol, drug, or combined substances) alone was not related to condom use; rather, alcohol consumption interacted with partner type (adjusted OR = 0.21, $p < .01$). Consistent with our hypotheses, women were less likely to use a condom with nonprimary partners when drinking (9 of 42 occasions) versus when no alcohol was consumed (48 of 122 occasions) (OR = 0.42, 95% confidence interval [CI]: 0.19-0.96; see Figure 1). For sexual events with primary partners, there were no differences in the proportion of women using condoms when drinking (18 of 57 occasions) versus no alcohol use (70 of 333 occasions) (OR = 1.73, 95% CI: 0.94-3.22; see Figure 1). For all three models, the odds of condom use increased when women had sex with nonprimary versus primary partners (adjusted ORs: 2.46-2.47, *p*s < .001).

Examining participant and partner's substance use. Because the risk of unprotected sex may be exacerbated by a partner's substance use concurrent with sex, exploratory analyses examined whether both partners, one partner, and no partners were using substances before the sexual event. In these exploratory analyses, we excluded the subset of participants (alcohol: $n = 238$; drug use: $n = 236$) who were unsure of their partner's substance use concurrent with sex

Table 4. Logistic regression analyses examining the effects of substance use, partner type, and partner use on condom use at last sex by gender

	Women		Men	
Predictor	AOR (95% CI)	*p*	AOR (95% CI)	*p*
Alcohol use	(*n* = 450)		(*n* = 499)	
Age	0.65 (0.49-0.86)	.003	0.65 (0.51-0.83)	.001
Education	0.56 (0.36-0.87)	.010	0.84 (0.55-1.27)	.398
Marital status	2.12 (0.70-6.41)	.183	1.90 (0.70-5.13)	.209
Alcohol use concurrent with sex (none)[a]				
Alcohol use concurrent with sex (one partner)	1.41 (0.74-2.69)	.303	0.50 (0.17-1.50)	.216
Alcohol use concurrent with sex (both partners)	1.73 (0.83-3.63)	.145	0.58 (0.23-1.48)	.253
Partner type	1.39 (0.81-2.36)	.229	2.51 (1.42-4.43)	.002
Alcohol Use (none) × Partner Type[a]				
Alcohol Use (one partner) × Partner Type	0.68 (0.21-2.23)	.524	1.56 (0.40-6.09)	.521
Alcohol Use (both partners) × Partner Type	0.16 (0.05-0.56)	.004	1.25 (0.40-3.99)	.701
Drug use	(*n* = 430)		(*n* = 413)	
Age	0.70 (0.53-0.93)	.015	0.68 (0.49-0.80)	.004
Education	0.56 (0.35-0.88)	.013	0.90 (0.63-1.45)	.669
Marital status	1.69 (0.66-4.34)	.278	3.41 (0.88-0.45)	.108
Drug use (nonalcohol) concurrent with sex (none)[a]				
Drug use (nonalcohol) concurrent with sex (one partner)	0.97 (0.40-2.36)	.940	0.38 (0.11-1.30)	.121
Drug use (nonalcohol) concurrent with sex (both partners)	0.70 (0.19-2.51)	.579	1.31 (0.31-5.48)	.710
Partner type	2.06 (0.92-4.62)	.078	1.06 (0.37-2.99)	.915
Drug Use (nonalcohol) × Partner Type (none)[a]				
Drug Use (nonalcohol) × Partner Type (one partner)	1.01 (0.25-3.99)	.993	0.83 (0.14-5.06)	.838
Drug Use (nonalcohol) × Partner Type (both partners)	0.31 (0.04-2.46)	.270	0.19 (0.01-2.38)	.192
Combined substance use	(*n* = 511)		(*n* = 536)	
Age	0.63 (0.48-0.81)	<.001	0.66 (0.53-0.82)	<.001
Education	0.55 (0.36-0.84)	.006	0.87 (0.58-1.29)	.474
Marital status	1.50 (0.59-3.81)	.395	2.02 (0.67-6.09)	.213
Substance use concurrent with sex (none)[a]				
Substance use concurrent with sex (one partner)	1.14 (0.40-3.28)	.803	0.62 (0.25-1.58)	.319
Substance use concurrent with sex (both partners)	0.90 (0.19-4.35)	.897	0.51 (0.11-2.31)	.379
Partner type	1.61 (0.71-3.66)	.254	2.15 (1.05-4.42)	.037
Substance Use × Partner Type (none)[a]				
Substance Use × Partner Type (one partner)	0.44 (0.09-2.18)	.314	0.96 (0.26-3.48)	.949
Substance Use × Partner Type (both partners)	0.61 (0.09-4.16)	.610	1.05 (0.18-6.28)	.958

Notes: Age is a continuous variable and was centered; all other variables were dummy coded (education: 1 = high school degree or less, 0 = at least some college; marital status: 1 = currently single, 0 = married; alcohol, drug, or substance use concurrent with sex by partners: 2 = both partners, 1 = one partner, 0 = no partners; partner type: 1 = nonprimary, 0 = primary). AOR = adjusted odds ratio; CI = confidence interval.

[a]Reference category.

(i.e., responded "unknown"). In three separate models (stratified by gender), the probability of condom use (yes, no) was predicted from participant–partner substance use (alcohol, drugs, and combined use by both partners, one partner only, or no partners) concurrent with sex (yes, no) and partner type (nonprimary, primary) using logistic regression analyses (Table 4). Among women, both participant and partner alcohol consumption (but not drug or combined substance use) interacted with partner type (adjusted OR = 0.16, 95% CI: 0.05-0.56, $p < .01$). Women who reported both they and their nonprimary partners were drinking before sex were less likely to use a condom. No significant interactions between substance use (alcohol, drugs, or combined substances) were found among men.

Discussion

Using event-level methods, we examined the association between risky sexual behavior and substance use among patients attending an STD clinic. Results indicate an association between unprotected vaginal and/or anal sex (i.e., less condom use) following substance use, but this association emerged only for alcohol consumption and varied by gender and partner characteristics. In bivariate analyses, substance use (alcohol, drugs, or combined use) was not associated with condom use for both women and men. Multivariate analyses showed a more complex pattern. Consistent with the bivariate analyses, condom use was unrelated to alcohol, drug, or combined substance use alone for both women and men. Condom use was associated with nonprimary versus primary sexual partners. However, among women, but not men, partner type interacted with alcohol consumption such that less condom use occurred when drinking preceded sex with nonprimary partners. Further analyses showed that, when a woman and her nonprimary partner were drinking concurrent with sex, they were less likely to use condoms during sex.

Consistent with prior research among samples of college students, intravenous drug users, and men who have sex with men (Arasteh et al., 2008; Brown and Vanable, 2007; Corbin and Fromme, 2002; Labrie et al., 2005; Vanable et al., 2004), these results confirm that partner type and partner drinking moderates the association between substance use and risky sexual behavior. However, evidence for the interaction of partner type/drinking and alcohol use was found only for women, not for men. In our study, events concurrent with alcohol use were reported by 26% of the women with nonprimary partners versus 15% of women with primary partners. (For women who reported if their partner was using alcohol before sex, alcohol consumption by both partners before sex was reported by 28% of the women with nonprimary partners vs 14% of women with primary partners.) It is likely that alcohol may be used as a means to reduce social inhibitions, thereby contributing to unplanned sex with new partners (Mckirnan et al., 1996; Simbayi et al., 2006). In contrast, alcohol use is less likely to influence decisions to use condoms, given that sexual scripts are already well established among primary partners (Lansky et al., 1998; Macaluso et al., 2000). Because men have direct control over condom use, alcohol use may exert less influence over their condom use. In contrast, gender-based power imbalances may be exacerbated when women drink (Amaro, 1995; Wingood and Diclemente, 1998). Prior research suggests that gender-based power imbalances may inhibit or impair women-initiated negotiation strategies with sexual partners (Pulerwitz et al., 2002; Wingood and Diclemente, 1998). Our exploratory analyses, however, show condom use is less likely when women and their nonprimary partners are drinking but not when only one partner is drinking. Further examination among women with only one drinking partner showed that male partners were drinking in 85% of the primary and 74% of the nonprimary relationships. It is plausible that gender-based power imbalances may inhibit women's ability to negotiate condom use regardless of drinking status. For women, this is particularly detrimental because women's risk of contracting HIV or STDs through heterosexual contact is estimated to be eight times greater than that for men (Padian et al., 1997).

Previous research has shown a link between non-alcohol-related drug use and risky sexual behavior among nonprimary partners (Leigh et al., 2008a; Schafer et al., 1994). Our results suggest that drug use, either alone or in combination with alcohol use, is not universally associated with condom use at the event level. However, the frequency of drug use alone (13% women, 11% men), or in combination with alcohol use (11% women, 17% men), concurrent with sex was reported by a minority of the participants, limiting our ability to fully evaluate the risks associated with other drug use (including specific types of drugs used). Instead, our findings suggest that alcohol consumption alone is more closely related to risky sexual behavior among women STD clinic patients. We did not assess specific type of drugs used at the event level; thus, it is possible that our combined drug-use measure restricted our ability to detect specified drug use–risky sexual behavior links. Indeed, recent research found use of certain types of drugs, such as amphetamines—but not heroin, crack/cocaine, or marijuana—was related to risky sexual behavior among a sample of drug-offending men (Leigh et al., 2008a).

Limitations

The limitations of this study should be considered in interpreting our findings. First, as with any study conducted at a single site, the sample may not be representative of all STD clinic patients. Second, data were gathered from self-reports and may contain errors or be vulnerable to self-presentation biases. However, our focus on the most recent event should

minimize recall difficulties, and the use of audio computer-assisted self-interview optimized patient privacy. Third, we examined a discrete event rather than multiple events; assessment of a single event increases precision and minimizes the cognitive burden, time commitment, and potential reactivity on participants, but it may not be representative of patients' typical sexual behavior. Multiple-event methods, such as diary methods, may provide more information regarding participants' sexual behavior, but there is insufficient evidence to conclude that multiple-event methods are less burdensome and/or reactive than other methodology (for a discussion, see Bolger et al., 2003; Reis and Gable, 2000). Fourth, we measured the association between condom use and any alcohol use instead of alcohol intoxication (cf. Arasteh et al., 2008). Pharmacological effects of differing amounts of alcohol (e.g., a single serving vs five or more standard drinks) preceding sex may alter its effect on sexual behavior. Fifth, we did not assess specific drugs used, limiting information regarding drug-specific effects. Finally, we did not assess other individual characteristics (e.g., personality traits) that may help to explain the association between substance use and risky sexual behavior.

Conclusions

This research carries implications for risk reduction; in particular, these findings suggest that risk reduction strategies for women should address the important role of alcohol use, especially in the context of nonprimary partnerships. Interventionists might seek to increase awareness of the effects of alcohol use on decision-making and interpersonal skills; for example, providing a skills-based intervention for women that targets specific situations wherein alcohol consumption and the opportunity to have sex co-occur (e.g., meeting new partners at a bar). Skills-based interventions for women could focus on condom-use preparations (e.g., carrying condoms), moderation strategies to reduce alcohol consumption (e.g., alternating drinks of water), planning sexual risk avoidance strategies (e.g., eroticizing condom use), identification of high-risk sexual situations (e.g., parties, bars, clubs), and rehearsing (overlearning) sexually assertive responses to unprotected sex. Intervention strategies can help women to reduce their risk for HIV and other STDs.

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